

WHAT IS CLAIMED IS:

JKB

1. An injector system comprising:
a powered injector;
a pressurizing chamber in operative connection with the powered injector;
a fluid path in fluid connection with the pressurizing chamber; and
a manual control in fluid connection with the fluid path, the manual control comprising at least one actuator for controlling the injector through application of force by an operator, the actuator providing tactile feedback of pressure in the fluid path to the operator via fluid connection with the fluid path, the actuator being adapted to stop an injection procedure if no force is applied to the actuator.
2. The injector system of Claim 1 wherein the manual control comprises a chamber in fluid connection with the fluid path, the actuator comprises a button in operative connection with a piston disposed within the chamber, and the button is biased in an off position.
3. The injector system of Claim 1 wherein the at least one actuator controls the injector in a low pressure mode.
4. The injector system of Claim 3 wherein the first actuator provides control of flow rate by changing the force thereon.
5. The injector system of Claim 3 wherein the manual control further

comprises a second actuator having an on state and an off state, the second actuator causing the injector to enter into a preprogrammed high pressure injection mode when placed in the on state.

6. The injector system of Claim 3 wherein the manual control further comprises a third actuator for controlling flow of saline in the fluid path.

7. The injector system of Claim 1, further comprising an audible feedback unit in operative connection with the at least one actuator, the audible feedback unit operable to provide audible feedback to the operator.

8. The injector system of Claim 1 wherein the manual control is adapted to be purged of air before injection.

9. The injector system of Claim 8 wherein the manual control comprises a purge valve.

10. An injection system for use in angiography, comprising:

a powered injector in fluid connection with a source of injection fluid; and

a pressure sensor in fluid connection with the powered injector via a pressure activated isolator adapted to isolate the pressure sensor from pressures in the fluid path above a set pressure, the pressure sensor being free to change elevation with a patient catheter in fluid connection with the powered injector.

11. An angiographic injection system for injecting an injection fluid into a patient, the system comprising:

a pressurizing device for supplying injection fluid under pressure;

a low pressure fluid delivery system; and

a pressure isolation mechanism having a first port for connection to the pressurizing device, a second port for connection to the patient, and a third port for connection to the low pressure fluid delivery system, the pressure isolation mechanism comprising a valve having a first state and a mutually exclusive second state; the first state occurring when the second and third ports are connected and the first and third ports are connected, the second state occurring when the first and second ports are connected and the first and third ports are disconnected, the valve being normally biased to the first state and being switchable to the second state when fluid pressure from the syringe pump reaches a predetermined pressure level.

12. The system of Claim 11, further comprising a valve in line between the pressurizing device and the first port of the pressure isolation mechanism.

13. The system of Claim 12 wherein the valve in line between the pressurizing device and the first port of the pressure isolation mechanism is an automated valve.

14. The system of Claim 11 wherein the low pressure delivery system comprises a source of flushing fluid, a drip chamber in fluid connection with the source of flushing fluid and a detector to sense the amount of flushing fluid in the source of saline.

15. The system of Claim 14, further comprising a flushing fluid control valve and a bubble detector in line between the flushing fluid drip chamber and the pressure isolation mechanism.

16. The system of Claim 15 wherein the pressurizing device is in fluid connection with a source of injection fluid via an injection fluid drip chamber, the system further comprising a detector to sense the amount of injection fluid in the source of injection fluid.

17. The system of Claim 16, further comprising an injection fluid control valve and a air detector in line between the injection fluid drip chamber and the pressure isolation mechanism.

18. The system of Claim 17, further comprising a handheld controller to control injection of injection fluid and injection of flushing fluid.

19. The system of Claim 18 wherein the handheld controller comprises a first control having a first mode to control injection of injection fluid in a low pressure mode, the flow rate of the injection being directly proportional to the distance the first control is depressed.

20. The system of Claim 19 wherein low pressure injection is ceased if the first control is released while in the first mode.

21. The system of Claim 20 wherein the first control has a second mode to control injection of injection fluid in a high pressure mode, the high pressure mode being ceased if the first control is released while in the second mode.

22. The system of Claim 21 wherein the hand controller further comprises at least a second control to control injection of flushing fluid.

23. The system of Claim 22 wherein injection of saline is ceased if the second control is released during injection of flushing fluid.

24. The system of Claim 11, further comprising a pressure transducer in fluid connection with the third port of the pressure isolation mechanism.

25. An injection system for use in angiography, comprising:

a source of a flushing fluid;

a pump in operative connection with the source of flushing fluid to pressurize the saline;

a flushing fluid valve in operative connection via a first port thereof with an outlet of the pump;

a first connector in fluid connection with a second port of the flushing fluid valve;

a source of contrast;

a contrast valve in operative connection with the source of contrast via a first port of the contrast valve;

a powered injector in operative connection with a second port of the contrast valve;

a second connector in operative connection with a third port of the contrast valve;

a pressure isolation mechanism having lumen including a first port in fluid connection with the second connector and a second port in fluid connection with a patient catheter, the pressure isolation mechanism also having a third port in fluid connection with lumen and with the first connector, the pressure isolation mechanism comprising a valve having a first state and a second state, the first state occurring when the lumen and the third port are connected, the second state occurring when the lumen and the third port are disconnected, the first port and the second port of the lumen being connected in the first state and in the second state, the valve being normally biased to the first state and being switchable to the second state when fluid pressure in the lumen from the powered injector reaches a predetermined pressure level; and a pressure transducer in fluid connection with the third port of the pressure isolation mechanism.

26. The system of Claim 25, further comprising a first air detector in fluid connection between the saline valve and the first connector and a second air detector in fluid connection between the contrast valve and the second connector.

27. The system of Claim 25, further comprising a first drip chamber in fluid connection between the source of saline and the pump and a detector in operative connection with the first drip chamber to sense the amount of saline in the source of saline.

28. The system of Claim 27, further comprising a second drip chamber in fluid connection between the source of contrast and the contrast valve and a detector in operative connection with the second drip chamber to sense the amount of injection fluid in the source of injection fluid.

29. The system of Claim 25, further comprising a handheld controller to control injection of injection fluid and injection of flushing fluid.

30. The system of Claim 29, further comprising a foot controller to control injection of at least one of injection fluid and injection of flushing fluid.